Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended) A communication receiver, comprising:

an input for receiving a modulated analog signal containing digital information;

a front end unit operable for performing ~~analog to digital~~ analog-to-digital conversion, for performing demodulation and for performing timing control, and further operable for producing a demodulated complex-valued digital signal from the modulated analog signal;

a digital equalizer connected for receiving the demodulated ~~complex valued~~ complex-valued digital signal, comprising:

a first filter operable for receiving the demodulated ~~complex valued~~ complex-valued digital signal, said first filter with adaptive coefficients where ~~adaption~~ adaptation ~~depends only on prior inputs and output of said first filter~~ is according to the following formula:

$$p_{n+1}[l] = p_n[l] + \Gamma_n(s_2[n])\, s_1{}^*[n-l] \qquad l = 1, \ldots, L$$

where $p_n[l]$ is the l-th tap of the first filter after calculation of n outputs, $p_n[0] = 1$, $s_1[n]$ is the input sequence to the first filter, $s_2[n]$ is the output of the first filter, and $\Gamma_n(.)$ is a function whose parameters may depend upon a symbol index n;

a second filter connected to the first filter and operable for reducing the amount of noise and ~~inter symbol~~ inter-symbol interference in the demodulated ~~complex valued~~ complex-valued digital signal without the use of training data; and

a ~~symbol to bit~~ symbol-to-bit converter connected to the second filter.

Claim 2 (currently amended) The communication receiver according to claim 1 wherein the first filter operates to reduce the eigenvalue spread of an input spectrum of the demodulated ~~complex valued~~ complex-valued digital signal.

Claim 3 (cancelled)

Claim 4 (currently amended) The communication receiver according to claim 1 wherein the second filter further includes a rotator for restoring the phase of the demodulated ~~complex valued~~ complex-valued digital signal without the use of training data.

D1 Cont.

Claim 5 (currently amended) The communication receiver according to claim 1 wherein the second filter further includes a nonlinear feedback network for removing the inter-symbol interference without the use of training data in the demodulated ~~complex valued~~ complex-valued digital signal.

Claim 6 (original) The communication receiver according to claim 1 wherein the first filter further comprises an L-tap Finite-Impulse-Response (FIR) Filter, where $L \geq 1$, whose first tap is set to a fixed value, and the filter's taps are adjusted so that its output power is minimized.

Claim 7 (currently amended) The communication receiver according to claim 1 wherein the second filter further comprises an M-tap FIR filter whose taps are adjusted according to the following formula:

$$c_{n+1}[m] = c_n[m] + \varphi_n(s_5[n])\, s_3{}^*[n-m] \qquad m = 1, \ldots, M$$

where $c_n[m]$ is the m-th tap of the second filter after calculation of n outputs, $s_3[n]$ is the input sequence to the second filter, $s_5[n]$ is the sum of the output of the second filter and a decision feedback filter, and $\varphi_n(.)$ is a ~~complex valued~~ complex-valued function, whose parameters may depend ~~on the~~ upon a symbol index n;

and the decision feedback filter is an N-tap backward FIR filter whose taps are adjusted according to the following formula:

$$d_{n+1}[i] = d_n[i] + \Psi_n(s_5[n])\, \hat{a}^*[n-i] \qquad i = 1, \ldots, N$$

where $d_n[i]$ is the i-th tap of the decision feedback filter after calculation of n outputs, $\hat{a}[n]$ is a sequence of detected data, and $\Psi_n(.)$ is a ~~complex valued~~ coplex-valued function, whose parameters may depend on the symbol index n.

Claim 8 (original) The communication receiver according to claim 7, wherein for some values of n:

$$\varphi_n(x) = \delta[n]\, (\mathrm{Re}^2(x) - k_2)\, \mathrm{Re}(x)$$

where Re(.) denotes the real part of a complex number, k_2 is a scalar, and $\delta[n]$ for $n = 1, 2, \ldots$ is a sequence of numbers.

Claim 9 (original) The communication receiver according to claim 7, where for some values of n:

$$\varphi_n(x) = \delta[n]\, (|x|^2 - k)\, (x)$$

where k is a scalar, and $\delta[n]$ is a sequence of numbers.

Claim 10 (currently presented) The communication receiver according to claim 7, where for some values of n:

$$\varphi_n(x) = \delta[n]\, (x - \hat{a}(x))$$

where $\hat{a}(x)$ is ~~the~~ a result of a memoryless nearest neighbor symbol detector whose input is x, and $\delta[n]$ is a sequence of numbers.

Claim 11 (currently amended) The communication receiver according to claim 7, where for some values of n:

$$\Psi_n(x) = \delta[n]\, (\mathrm{Re}^2(x) - k)\, \mathrm{Re}(x)$$

where Re(.) denotes the real part of a complex number, k is a scalar, and $\delta[n]$ for $n = 1, 2, \ldots$ is a sequence of numbers.

Claim 12 (original) The communication receiver according to claim 7, where for some values of n:

$$\Psi_n(x) = \delta[n]\,(|x|^2 - k)\,(x)$$

where k is a scalar, and $\delta[n]$ is a sequence of numbers.

Claim 13 (currently amended) The communication receiver according to claim 7, where for some values of n:

$$\Psi_n(x) = \delta[n]\,(x - \hat{a}(x))$$

where $\hat{a}(x)$ is ~~the~~ a result of a memoryless nearest neighbor symbol detector whose input is x, and $\delta[n]$ is a sequence of numbers.

Claim 14 (currently amended) The communication receiver according to claim 1, wherein the second filter further comprises:

an adaptive rotator connected to receive the demodulated ~~complex valued~~ complex-valued digital signal;

an adaptive feed forward equalizer finite impulse response filter connected to the adaptive rotator;

a signal summation circuit connected to the adaptive feed forward equalizer finite impulse response filter and to an adaptive finite impulse response filter, the output of which is connected to update the adaptive rotator, the adaptive feed forward equalizer finite impulse response filter and the adaptive finite impulse response filter;

a symbol detector connected to the signal summation circuit and the symbol-to-bit convertor; and

the adaptive finite impulse response filter connected to the symbol detector and operable for adapting to the summation result of the signal summation circuit.

Claim 15 (original) The communication receiver according to claim 1, wherein the modulated analog signal is a modulation type selected from the group consisting of PAM (Pulse Amplitude Modulation), QAM (Quadature Amplitude Modulation),

PSK (Phase Shift Keying), CAP (Carrierless AM-PM) , NRZ (Non-Return to Zero), offset-QPSK, and π/4-QPSK.

Claim 16 (currently amended) A digital communication receiver, comprising:

~~a~~ an input stage for receiving ~~an~~ a modulated analog signal containing digital information;

an ~~analog to digital~~ analog-to-digital converter connected for producing a complex-valued digital signal from the modulated analog signal;

a demodulator connected for producing a demodulated complex-valued digital signal from the complex-valued digital signal;

a pre-equalizer filter connected to receive the demodulated complex-valued digital signal, comprising:

a first adaptive finite impulse response filter having an output, having a tap adjustment input and connected to receive the demodulated complex-valued digital signal;

a first summation circuit connected to sum the demodulated complex-valued digital signal with the output of the first adaptive finite impulse response filter to produce a pre-equalized complex-valued signal;

a function circuit connected to receive the pre-equalized complex-valued signal and operable for producing therefrom a non-linear response to the pre-equalized complex-valued signal;

an adaptation unit connected to receive the demodulated complex-valued digital signal, connected for receiving the non-linear response and connected to the tap adjustment input of the first adaptive finite impulse response filter to provide an adjustment to the first adaptive finite impulse response filter;

a digital decision feedback equalizer connected to receive the pre-equalized complex-valued signal, comprising:

a rotator having an adaptive input and connected to receive the pre-equalized complex-valued signal and operable for restoring ~~the~~ a phase of input

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data contained in the pre-equalized complex-valued signal without the use of training data;

a feed forward equalizer finite impulse response filter having an adaptive input, an input connected to the rotator, an output, and operable for adaptively reducing ~~the~~ an amount of noise and inter-symbol interference in the pre-equalized complex-valued signal without the use of training data;

a second summation circuit connected to sum the output of the feed forward equalizer finite input response filter with ~~the~~ an output of a second adaptive finite response filter and for producing therefrom a corrected complex-valued signal;

a symbol detector connected to receive the corrected complex valued signal and to produce a symbol signal;

the second adaptive finite impulse response filter having an output, an adaptive input and connected to receive the symbol signal;

wherein the corrected complex-valued signal is connected to the adaptive input of the rotator, the adaptive input of the feed forward equalizer finite impulse response filter and the adaptive input of the second adaptive finite impulse response filter; and

a symbol-to-bit converter connected to receive the symbol signal and to produce therefrom digital bits corresponding to the digital information.

Claim 17 (currently amended) A method of receiving a digital communication signal in the presence of inter-symbol interference, comprising the steps of:

receiving an analog signal modulated with digital information;

converting the analog signal to produce a digital signal;

multiplying the digital signal with sine and cosine signals to produce a complex-valued digital signal;

adaptively pre-equalizing the complex-valued digital signal to produce a pre-equalized complex-valued digital signal;

adaptively equalizing the pre-equalized complex-valued digital signal to reduce the inter-symbol interference and to produce a corrected complex valued symbol signal without the use of training data; and

converting the corrected ~~complex valued~~ complex-valued symbol signal to the digital information.

Claim 18 (currently amended) The method according to claim 17, wherein the step of adaptively pre-equalizing further comprises the steps of:

D1 Cont.

adaptively filtering the complex-valued digital signal with an adaptive filter to produce a filtered complex-valued digital signal

summing the complex-valued digital signal with the filtered complex-valued digital signal to produce the pre-equalized complex-valued digital signal;

producing a non-linear response to the pre-equalized complex-valued digital signal; and

modifying taps of the adaptive filter in response to the non-linear response to the pre-equalized complex-valued digital signal and in response to the complex-valued digital signal.

Claim 19 (currently amended) The method according to claim 17, wherein the step of adaptively equalizing further comprises the steps of:

adaptively rotating the pre-equalized complex-valued digital signal to produce a rotated ~~complex valued~~ complex-valued signal;

adaptively filtering the rotated ~~complex valued~~ complex-valued signal to produce a filtered rotated ~~complex valued~~ complex-valued signal;

summing the filtered rotated ~~complex valued~~ complex-valued signal with an adapted filter output to produce an adapted complex-valued signal;

detecting the symbols in the adapted complex-valued signal to produce the corrected ~~complex valued~~ complex-valued symbol signal; and

producing the adapted filter output by adaptively filtering the corrected ~~complex valued~~ complex-valued symbol signal.

Claim 20 (currently amended) A communication system, comprising:

a digital communications transmitter;

a communications medium; and

a digital communications receiver, comprising:

an input receiving a modulated analog signal containing digital information;

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an ~~analog-to-digital~~ analog-to-digital converter connected for producing a complex-valued digital signal from the modulated analog signal;

a demodulator connected for producing a demodulated ~~complex-valued~~ complex-valued digital signal from the ~~complex valued~~ complex-valued digital signal;

a digital equalizer connected for receiving the demodulated ~~complex valued~~ complex-valued digital signal, comprising:

a first filter operable for receiving the demodulated ~~complex-valued~~ complex-valued digital signal, said first filter with adaptive coefficients where ~~adaption~~ adaptation ~~depends only on prior inputs and output of said first filter~~ is according to the following formula:

$$p_{n+1}[l] = p_n[l] + \Gamma_n(s_2[n])\, s_1{}^*[n-l] \qquad l = 1, \ldots, L$$

where $p_n[l]$ is the l-th tap of the first filter after calculation of n outputs, $p_n[0] = 1$, $s_1[n]$ is the input sequence to the first filter, $s_2[n]$ is the output of the first filter, and $\Gamma_n(.)$ is a function whose parameters may depend upon a symbol index n;

a second filter connected to the first filter and operable for reducing the amount of noise and ~~inter-symbol~~ inter-symbol interference in the demodulated ~~complex-valued~~ complex-valued digital signal without the use of training data; and

a ~~symbol-to-bit~~ symbol-to-bit converter connected to the second filter.

Claim 21 (original) The communication receiver according to claim 1 wherein the receiver is used with a digital subscriber loop of a telephone network.

Claim 22 (original) The communication receiver according to claim 1 wherein the receiver is used with a coaxial cable television infrastructure.